SITE: Carrier Air
BREAK: 1.8
OTHER: R2

TECHNICAL MEMORANDUM — COMMENT RESPONSE DOCUMENT
Site Downgradient Monitoring Well
Data Quality Assessment
USEPA Comments Received: August 19, 1994

USEPA General Comment 1:

The code CAPZONE has been used by Carrier in the assessment of this facility. CAPZONE is not listed in Compilation of Groundwater Models, USEPA Office of Research and Development, WPA/600/R-93/188. Please provide information regarding this model.

Response:

A brief writeup describing the CAPZONE/GW-Path analytical flow models is attached, to provide USEPA with adequate background regarding the models' use; this document will be included as Appendix D to the Technical Memorandum. A copy of the CAPZONE and GW-Path users' manuals can be provided upon request.

USEPA General Comment 2:

The modeling that has been conducted has ignored the partial penetration of the Memphis Sands by the extraction wells in addition to the unconfined nature of the Memphis Sands where the overlying clay is absent. Both of these factors have the potential to introduce error into the modeling and should be addressed. While Carrier has circuitously attempted to address the partial penetration issue by stating that the aquifer has two zones and that the upper more prolific 200 foot thick zone is the production zone, this zone is not, to our knowledge, hydraulically isolated from the remaining 300 feet of the Memphis Sand. The partial penetration of the Memphis Sand will include vertical flow from the lower zone which does not appear to be accounted for in the current modeling.

Response:

Initial calculation of aquifer parameters using AQTESOLV accounted for partial penetration of the extraction wells and observation wells. These data are documented in the *East Wall Aquifer Pumping Test Report*, dated December 14, 1992.

The unconfined nature of the Memphis Sand upgradient of the clay pinchout has been modeled using image well theory. Two image wells were modeled southeast of the Carrier facility to approximate the recharge boundary. These wells were used both in the initial calibration of the CAPZONE model and in transport modeling.

Boring log data were used to assess grain size and stratographic distinctions within the Memphis Sand aquifer. Clearly, the partial penetration of the Memphis Sand will include vertical flow from the lower (fine sand) zone. However, due to the distinction between grain size, it is apparent that the majority of flow will be derived from the upper 200 feet of the aquifer. Transport times observed agree with the "effective" thickness of 200 feet.

USEPA General Comment 3:

Potentiometric surface maps should be presented depicting the exact location of the capture zones for the wells based on monitoring well data and modeling data (initial and current conditions). Also, present a table of all new water level data.

Response:

Table 2 presents water levels used during modeling. Static, east well, two-well, and June 1994 data are presented. Static data were used to develop the SURFER potentiometric surface MOD2.GRD. June 1994 data represent pumping conditions. Pumping water level data were used to calibrate the CAPZONE model on a point-by-point basis.

Figure 3 in the revised Technical Memorandum presents the surface MOD2.GRD. Pumping water level surfaces are not presented due to the lack of symetrical or regularly-spaced data in the immediate vicinity of Water Plant 2; SURFER-generated interpolations of irreguarly-spaced pumping data do not correlate with the conceptual understanding of the Water Plant 2 capture mechanism.

Figure 4 shows the theoretical capture zones for Water Plant 2 generated using current pumping rates and superimposed upon MOD2.GRD. As shown in the figure, capture is effected across the area of concern. Six-year capture zones are presented. Reverse particle tracking from MW-62 indicates that a particle originating in the vicinity of MW-16 would take 14 years to reach the downgradient monitoring well locations. Further model refinement within the narrow band between the 14-year pathline and the western boundary of the capture zone is not possible due to the scale of the drawing.

USEPA General Comment 4:

The groundwater gradient appears to be in a downward direction or in a recharge mode to the Memphis Sand. Please specify that this gradient was determined while Water Plant 2 was pumping and what the possible implications are.

Response:

The presence of a slight downward gradient (0.2 ft) between MW-60 and MW-62 may suggest that pumping at Water Plant 2 is inducing a downward gradient towards the recovery wells. As Water Plant 2 was pumping at the time these water levels were measured, it is not clear whether this gradient is natural or induced.

Specific Comment 1; Page 7, Quality Assurance, Quality Control, last sentence:

One sample number 064794AS should be 061794AS.

Response:

The change will be incorporated as noted.

Specific Comment 2; Page 10, Groundwater Transport Modeling, Fourth Bullet:

What is NEW62.GRD?

Response:

NEW62.GRD is the current pumping-condition water level file developed using data measured on June 30, 1994. These data are presented in the last column of Table 2.

Specific Comment 3; Page 10, Groundwater Transport Modeling, Fourth Bullet:

Is a new static surface required since the grid did not calibrate well?

Response:

As discussed on page 14 of the memorandum, new water level measurements can be obtained during the next regularly scheduled maintenance activity at Water Plant 2. There is no pressing need to interrupt treatment at Water Plant 2 to obtain these measurements earlier.

Table 2 MeasuredWater Level Data (ft msl)						
Well	Easting	Northing	Static Elevations September, 1992 (MOD2.GRD)	East Well Test Pumping Elevations September 1992	Two-Well Test Pumping Elevations September 1992	June 30, 1994 Pumping Elevations (NEW62.GRD)
MW-1	9572.30	8599.61	283.68	283.40	283.19	282.72
MW-4	9926.60	8352.93	284.14	283.95	283.82	283.49
MW-10	9756.99	8783.99	283.67	283.40	283.20	282.69
MW-12	9616.85	9096.22	283.13	282.79	282.45	281.96
MW-14	8929.51	9478.77	282.61	281.85	280.84	280.06
MW-16	9052.00	7814.29	283.64	283.42	283.36	282.99
MW-58	8353.85	10751.20	280.75	279.97	279.92	278.86
APT-1	8482.92	10090.60	281.48	280.09	278.99	278.39
APT-2	8448.43	10028.70	281.51	280.27	279.12	278.51
MW-62	7204.04	10761.55	—	—	—	277.94

Figure 3 MOD2.GRD

Figure 5 Theoretical Capture Zone

Specific Comment 4; Page 14, Conditions at MW-62:

The Tennessee Division of Superfund (TSDF) believes that the difference in theoretical and current water levels at MW-62 is reason for some concern. As stated, this difference indicates that the static surface does not exactly represent water levels in the vicinity. TSDF would like to see a set of contemporary static- and pumping-condition water level measurements.

Response:

New water level measurements can be obtained during the next regularly scheduled maintenance activity at Water Plant 2. Variations between 1992 and 1994 data are likely due to seasonal or regional groundwater changes, and are not expected to grossly impact capture zones in the vicinity of Water Plant 2.

Specific Comment 5; Page 14, Travel Time Assessments:

Since this task is partly dependent upon CAPZONE-generated data, TSDF would like to see this modeled with contemporary water level measurements.

Response:

Once again, as discussed in the memorandum, current static and pumping water- level measurements can be taken during the next regularly scheduled maintenance activity at Water Plant 2, for further model validation. However, there is no need to shut down the remedial system at this time, as containment of the TCE plume is being effected.

During the next regularly-scheduled maintenance activity at Water Plant 2, two sets of water levels will be measured. The first will be collected approximately 3 days after the plant is shut down and the aquifer is given sufficient time to recover to static conditions. Water levels in those wells listed in Table 2 will be recorded. (If the pumps are re-started less than 3 days after shut-down, water levels will be collected immediately before the pumps are started.) Water levels will be re-measured 5 to 7 days after pumping is re-started at Water Plant 2 to assess the aquifer under contemporary pumping conditions. These data will be used to confirm the calibration discussed in the Technical Memorandum. A theoretical pumping water level surface will be developed using the static map, and will be compared to the actual surface observed after 5 to 7 days of operation. Residuals are expected to be on the order of +/- 0.2 ft. The new static surface will be included as Figure 5 in the Technical Memorandum, static, pumping, and theoretical pumping water levels will be compared in tabular format, and a brief discussion regarding the integrity of model calibration will be provided.